

CLAIM

1. A sorting method including the steps of:

forming an at least part annular flow of particulate material by axially flowing said particulate material over a body member having a substantially conical flow surface past which said material may pass;

operating a detector substantially centred within said annular flow downstream of said body member and selected to apply a sorting criterion on the particles in said flow; and

operating sorting means responsive to said detector to sort particles in said flow according to said criterion.

2. Sorting apparatus including:

a body member having a substantially conical surface bounded by an edge;

a supply of a particulate material to said flow surface, said supply being selected whereby said particulate material axially passes said edge forming an at least part annular flow;

a detector substantially centred within said annular flow downstream of said body member and selected to apply a sorting criterion on the particles in said flow; and

sorting means responsive to said detector to sort particles in said flow according to said criterion.

3. Sorting apparatus according to Claim 2, wherein said particles are formed into an annular, substantially mono-layer flow.

4. Sorting apparatus according to Claim 2, wherein said body member has a substantially horizontal peripheral edge and whereby said flow is directed substantially vertically from said edge under gravity.

5. Sorting apparatus according to Claim 2, wherein said particulate flow passes the edge of the body member to enter a detection area downstream of the body member and containing the detector.

6. Sorting apparatus according to Claim 5, wherein said detector scans the particulate flow in the detection by means selected from passive means or active means.
7. Sorting apparatus according to Claim 6, wherein said active means includes a radiation source to actively illuminate the particulate flow, the detector being selected to respond to irradiation of said particle flow.
8. Sorting apparatus according to Claim 7, wherein said particulate flow is irradiated by an actual or effectively rotating said source, and that the detector detects the intensity of the reflected or transmitted component of said radiation.
9. Sorting apparatus according to Claim 7 or Claim 8, wherein said source is a point source centrally located in the annulus of the flow path such that the path length from the source to the particle to the detector is essentially the same for all particles.
10. Sorting apparatus according to any one of Claims 7 to 9, wherein said source is a monochromatic point-source beam which scans the particulate flow in a direction normal to the particulate flow direction.
11. Sorting apparatus according to Claim 10, wherein said reflected light is filtered to remove all other wavelengths than the required wavelength to render the detected signal monochromatic.
12. Sorting apparatus according to Claim 11, wherein said filtering is performed using one or more band pass optical filters that transmit only the required wavelength bands.

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13. Sorting apparatus according to Claim 11, wherein said filtering is performed using one or more band reject optical filters that reflect only the required wavelength bands.
14. Sorting apparatus according to any one of claims 7 to 10, wherein said detected light is polychromatic.
15. Sorting apparatus according to Claim 14, wherein said polychromatic light is resolved into a spectrum by a diffraction grating, and wherein said detector comprises a plurality of detection elements disposed to interpret said spectrum.
16. Sorting apparatus according to Claim 15, wherein said detection elements are selected from photo multipliers, CCD arrays or like photoelectric sensitive measuring devices.
17. Sorting apparatus according to any one of Claims 2 to 16, wherein said sorting means comprises one or more rejectors responsive to said detector and adapted to impinge upon a selected particle to displace said particle from said flow.
18. Sorting apparatus according to Claim 17, wherein said one or more rejectors each comprise means to generate an air blast which rejects a detected particle from the particulate flow in response to a signal generated in response to detection by said detector.
19. Sorting apparatus according to Claim 18, wherein said rejectors comprise an annular manifold containing a single row of air valves, each valve facing approximately 90° to the particulate flow, substantially parallel to the product flow and offset with a clearance gap therefrom.
20. Sorting apparatus according to Claim 18, wherein said rejectors comprise a plurality of annular manifolds each containing a single row of air valves, each valve facing approximately 90° to the particulate flow, substantially parallel to the product

flow and offset with a clearance gap therefrom, and wherein said air valves are aligned between the rows in the direction of said flow, whereby aligned air valves are operated sequentially to impact a selected particle sequentially.

21. A sorting method including the steps of:

forming a flow of particulate material;

operating an optical detector assembly over said flow, said optical sensor assembly including a radiation source and a detector having at least one diffraction grating-based monochromator and being selected to apply a sorting criterion on the particles in said flow; and

operating sorting means responsive to said optical detector means to sort particles in said flow according to said criterion.

22. A sorting method including the steps of:

forming a flow of particulate material;

operating a detector assembly over said flow, said detector assembly being selected to apply a sorting criterion on the particles in said flow; and

operating an array of a plurality of fluid-jet sorting means responsive to said detector assembly to sort particles in said flow according to said criterion by impingement, said array being operable in concert or sequentially to sort a said particle.

23. Sorting apparatus including:

a continuous supply forming a flow of a particulate material;

an optical detector assembly over said flow, said optical detector assembly including a radiation source and a detector having at least one diffraction grating-based monochromator and being selected to apply a sorting criterion on the particles in said flow; and

sorting means responsive to said optical detector assembly to sort particles in said flow according to said criterion.

24. Sorting apparatus including:

means for forming a flow of particulate material;

a detector assembly over said flow, said detector assembly being selected to apply a sorting criterion on the particles in said flow; and

an array of a plurality of fluid-jet sorting means responsive to said detector means to sort particles in said flow according to said criterion by impingement, said array being operable in concert or sequentially to sort a said particle.